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GREAT LAKES FOREST RESEARCH CENTRE
CENTRE DE RECHERCHE FORESTIÈRE DES GRANDS LACS

Results of forest insect and disease surveys in the NORTHWESTERN REGION of Ontario, 1984

CARRIED OUT BY THE GREAT LAKES FOREST RESEARCH CENTRE IN COOPERATION WITH THE ONTARIO MINISTRY OF NATURAL RESOURCES

D.C. Constable

Miscellaneous Report No. 17

Canada

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THE GREAT LAKES FOREST RESEARCH CENTRE

The Great Lakes Forest Research Centre is one of six regional establishments located across Canada and operated by the Canadian Forestry Service. The overall objective of the Service is to promote the preservation, enhancement and wise use of a healthy, attractive and bountiful forest resource and terrestrial environment for the economic and social benefit of all Canadians. The Centre pursues this objective by conducting two major programs: research and technical services and forestry development. Both programs address major problems affecting forest management and the forest environment primarily in Ontario, but because of the transprovincial nature of the forest resource, many elements of our research program are of national significance.

Forestry problems are continually assessed by the Canada-Ontario Joint Forestry Research Committee, made up chiefly of senior members of the Centre and the Ontario Ministry of Natural Resources. The Committee ensures that the research resources of both agencies are effectively transmitted to the forest managers in order to improve forest production and protection, and the quality of the environment.

Staff of the forestry development program negotiate and administer federal-provincial cost-sharing agreements with the province of Ontario, conduct economic studies, and implement job creation programs in the forest sector. Again, this requires close cooperation with the Ontario Ministry of Natural Resources and with other provincial and federal agencies concerned with the forest sector.

Close working relations are also maintained by the Centre with educational institutions specializing in forestry and the biological sciences, with the forest industry, and with other forestry organizations in the province.

The Centre recognizes that forested land must be managed in the best public interest, not only for the wood production essential to our economy but also for the recreational purposes that are so important to our social well-being. These goals must be achieved in a manner that will maintain or improve the quality of the forest environment and preserve it for generations to come.

RESULTS OF FOREST INSECT AND DISEASE SURVEYS IN THE NORTHWESTERN REGION OF ONTARIO, 1984

(FOREST DISTRICTS: RED LAKE, SIOUX LOOKOUT, KENORA, DRYDEN, IGNACE and FORT FRANCES)

D.C. CONSTABLE

GREAT LAKES FOREST RESEARCH CENTRE

CANADIAN FORESTRY SERVICE

GOVERNMENT OF CANADA

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SURVEY HIGHLIGHTS

This report deals with the more important insect and disease problems detected from both ground and aerial surveys in the Northwestern Region in 1984.

C.A. Barnes, Regional Supervising Ranger, because of illness was unable to perform his field duties in the Fort Frances, Dryden and Kenora districts. As a result, general surveys and the normal collection of quantitative data were somewhat curtailed.

The spruce budworm was again the most important insect encountered and the area affected by this insect more than doubled in size. In 1983, 2.181 million ha were moderately to severely defoliated; in 1984 that number increased to 4.631 million ha. A total of 139,334 ha of jack pine was moderately to severely defoliated by the jack pine budworm in the Red Lake District and four small pockets of defoliation totalling 14,044 ha were mapped in the southwestern portion of Fort Frances District. Severe defoliation of Manitoba maple throughout the Region by the fall cankerworm persisted for the second year with an expansion into the Ignace District. The red pine sawfly caused moderate-to-severe defoliation of approximately 55,000 ha of fringe and understory trees in the Ignace District. Defoliation by the balsam fir sawfly ranging from 10 to 75% occurred on balsam fir across the Region. Once again populations of the yellowheaded spruce sawfly caused severe defoliation to many open-grown and roadside trees.

The incidence of spruce needle rusts was high at several locations in the Region. Frost damage occurred over a wide area of the Region with damage occurring mainly on aspen. Wind and hail damage affected approximately 4,000 ha of forested land in the Little Turtle Lake area of the Fort Frances District.

Special surveys were carried out in three white spruce plantations and four jack pine plantations. Six areas were evaluated for black spruce root rot in upland and lowland sites, 16 areas were evaluated for Hypoxylon canker and four permanent Hypoxylon plots established. Two acid rain plots were established in jack pine stands to detect early evidence of this problem. White spruce cones were collected to determine the organisms causing seed damage and to estimate seed loss.

In this report, the following categories are used to describe the importance of insects and diseases:

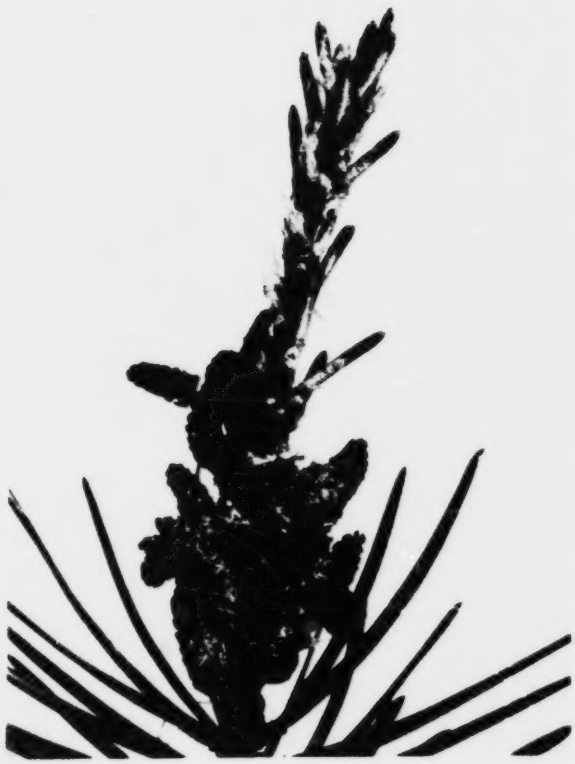
Major Insects or Diseases

Capable of causing serious injury to or death of living trees or shrubs

Frontispiece

Severe defoliation caused by the jack pine budworm, *Choristoneura pinus pinus* Free.

Jack pine budworm larva feeding on flowers



Minor Insects or Diseases *

Capable of causing sporadic or localized injury but not usually a serious threat to living trees or shrubs

Other Forest Insects/Diseases (Tables)

These tables provide information on two types of pest:

1) those which are of minor importance and have not been known to cause serious damage to forest trees,

2) those which are capable of causing serious damage but, because of low populations or for other reasons, did not cause serious damage in 1984.

Note: Forest districts affected by specific insects or diseases are listed beneath the names of those insects or diseases in the Table of Contents.

The author would like to express his appreciation to personnel of the Ontario Ministry of Natural Resources, wood-using industries and private individuals for their excellent cooperation during the 1984 field season.

* No minor diseases were reported in the Northwestern Region in 1984.

D.C. Constable

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INSECTS

Major Insects

Fall Cankerworm, *Alsophila pometaria* (Harr.)

For the second consecutive year, severe defoliation was observed at widely scattered locations in the Region (see photo page). Defoliation was especially severe on ornamental Manitoba maple (*Acer negundo* L.) throughout the towns of Sioux Lookout, Ignace, Dryden, Fort Frances and Kenora. In most instances defoliation of this host exceeded 75%. Other host trees affected by this defoliator, but to a much lesser extent, were white ash (*Fraxinus americana* L.), basswood (*Tilia americana* L.) and white elm (*Ulmus americana* L.).

Numerous inquiries were received from landowners and the general public concerning the fate of trees affected by the infestation. A news release by the Ontario Ministry of Natural Resources (OMNR) in the Sioux Lookout District was prepared, informing the public of proper control measures, both immediate and future. It was noticed in several towns that homeowners had placed sticky bands of tanglefoot around the trunks of trees in the fall to trap females as they climbed the trees to lay their eggs.

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

Results of damage surveys, population sampling and egg-mass counts of this perennial pest will be published with those of other regions at a later date in a report specifically devoted to this insect. That report will provide a complete description and analysis of developments in the spruce budworm situation in Ontario in 1984 and will give infestation forecasts for the province for 1985.

Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Infestations of this insect were reported as early as 1937 in the Hawk Lake area of the Kenora District. In the early 1960s infestations began to appear at numerous locations in the Fort Frances and Kenora districts and by 1967 the outbreak had peaked, and extended from the Whiteshell Provincial Park in Manitoba, east to Amesdale along the Canadian National Railway in the Dryden District. The total area infested in the Region was approximately 22,000 km^2 (see Frontispiece). However, by 1969 the infestation had collapsed with only 25 km^2 occurring north of Dryden. In 1971, several small pockets were reported in the Sioux Lookout, Fort Frances and Kenora districts but these infestations collapsed in 1972. The insect did not appear again until 1984 when four small pockets totalling 14,044 ha were mapped in the northwestern portion of Fort Frances District between Rice Bay on Rainy Lake, and Heron Lake. In the Red Lake District, a large infestation totalling

approximately 139,344 ha was reported between Musclow and Adventure Lakes. This infestation extended west into the province of Manitoba between Philips Lake and the Gammor River area (Fig. 1).

Egg-mass samples were collected at 23 locations in the Region (Table 1) to forecast results for 1985. It would appear from those egg-mass samples that the infestation in the Red Lake District will remain high with possible expansions to the north and south in the Haggart and Spoonbill Lake areas. In the Fort Frances District, the infestation north of the Little Turtle Lake Road and in the Watten-Farrington townships area will probably remain the same or increase slightly. A new infestation could possibly occur in the Hudson area of the Sioux Lookout District, where a high egg-mass count occurred.

Balsam Fir Sawfly, *Neodiprion abietis* complex

This insect is usually reported in conjunction with damage caused by the spruce budworm and infestations are normally of short duration.

The overwintering eggs hatch in the spring and larvae feed from mid-May to early August. At first they eat only part of a needle but as they grow the entire needle is consumed except for a stub. The young larvae usually feed in groups but as they grow older they feed separately. The full-grown larvae spin cocoons on the needles or in the ground litter and change to pupae. The pupae become adults in the fall, and after mating, the females lay their eggs in slits cut in needles.

During the period from 1974 to 1976 this sawfly was found in high populations which collapsed in 1977. Since that time, this insect has not been found in the Region. However, in 1984 infestations were observed throughout all districts of the Region with defoliation ranging from 10 to 75%. Damage was mainly confined to balsam fir *(Abies balsamea* [L.] Mill.), although white spruce *(Picea glauca* [Moench] Voss) and black spruce *(Picea mariana* [Mill.] B.S.P.) were also defoliated to a lesser extent.

This damage was most noticeable in the Kenora District. In the Nestor Falls--Sioux Narrows areas along Highway 71, severe defoliation of roadside and small pockets of balsam fir, not exceeding more than 1 ha in size, ranged from 50 to 75%. West of the town of Kenora along Highway 17, similar damage was observed as far as the Manitoba border.

In the Red Lake District, conspicuous foliar damage on balsam, ranging from 25 to 50%, was observed from the town of Ear Falls up to the Pakwash Lake area. Damage was similar throughout the Sioux Lookout and Dryden areas. In Ignace and Fort Frances districts, the insect could be found easily but was less spectacular than in any of the above-mentioned districts.

NORTHWESTERN REGION

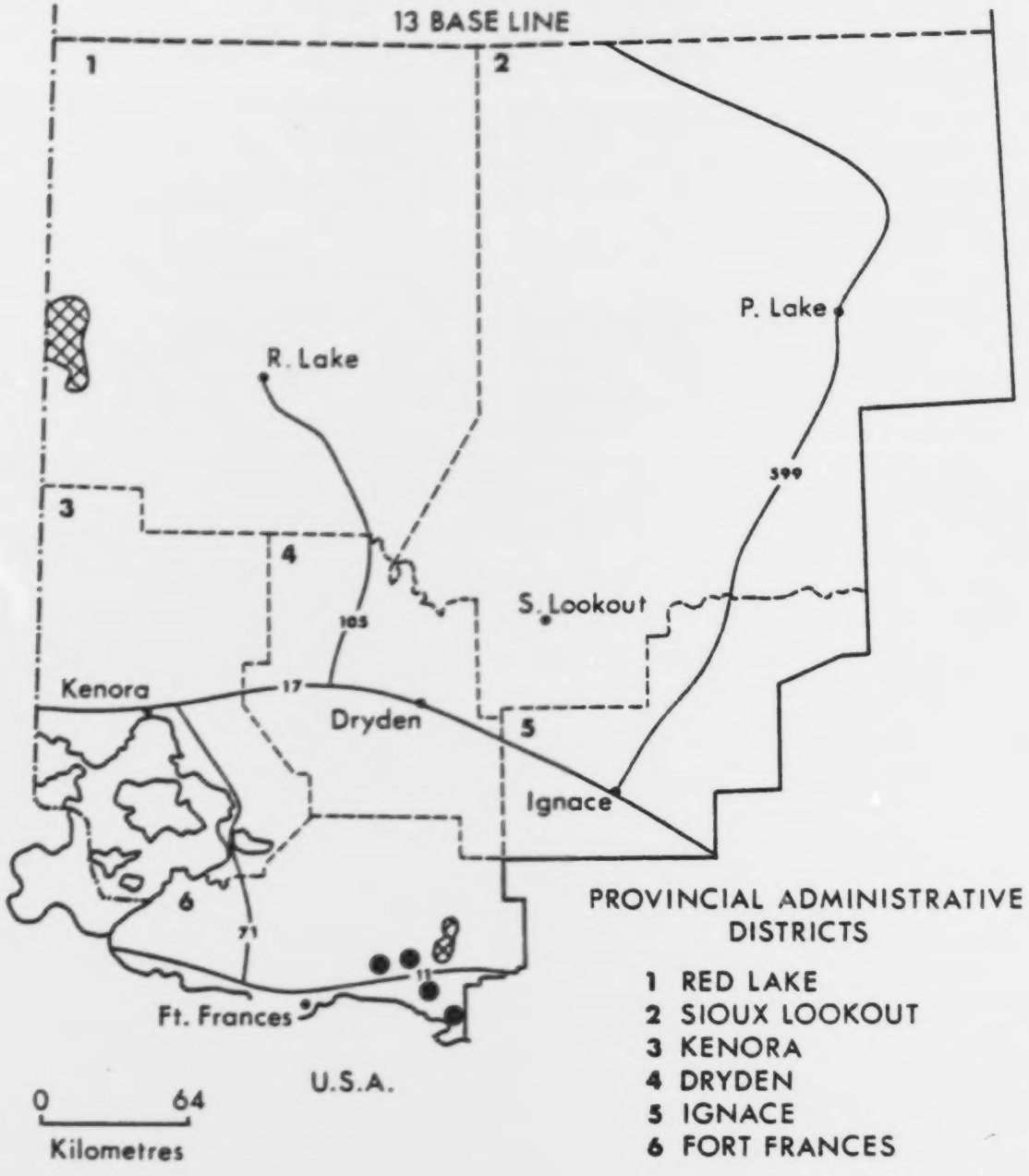


Figure 1. Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Areas in which defoliation of jack pine (*Pinus banksiana* Lamb.) occurred in 1984

Moderate-to-severe . . . ▨ or ●

Table 1. Summary of jack pine budworm defoliation estimates and egg-mass counts in 1984 and infestation forecasts for 1985.

Location	Estimated % defoliation 1984	Total no. of egg masses on six branch tips[a]	Infestation forecasts 1985[b]
Dryden District			
Melgund Twp	0	0	N
Tustin Twp (109)	0	0	N
Zealand Twp--OMNR Nursery (86)	0	0	N
Red Lake District			
Haggart Lake (86)	10	61	S
Knox Lake (84)	0	2	L
Musclow Lake (56)	59	46	S
Pine Needle Lake (81)	0	1	L
Sabourin Lake (94)	10	22	S
Spoonbill Lake (79)	1	19	S
Carroll Lake (66)	40	41	S
Gammon Lake (81)	100	78	S
Sioux Lookout District			
Hudson (86)	0	10	M-S
Fort Frances District			
Halkirk Twp	6	3	M
Little Turtle Lake Jct	33	2	L
Manion Lake Road	2	0	N
Mathieu Twp	0	0	N
Menary Twp	0	0	N
Ottertail Landing, Hwy 11	4	1	L
Shoal Lake Rd	7	0	N
Ignace District			
McNevin Twp	0	1	L
Kenora District			
Kirkup Twp - Rushing River Prov. Pk	2	0	N
McNicol Twp	5	0	N
Pellatt Twp	4	2	L

[a] Where branch tips are not a standard 61 cm, their average length appears in parentheses beside the location name.
[b] S = severe, M = moderate, L = light, N = nil.

Red Pine Sawfly, *Neodiprion nanulus nanulus* Schedl.

High populations of this defoliator continued for the second consecutive year. Approximately 55,000 ha of fringe and understory jack pine (*Pinus banksiana* Lamb.) along Highway 17 from Corman Township west to Skey Township in the Ignace District suffered defoliation ranging from 75 to 100%. In the Dryden District, similar defoliation was also observed on jack pine and red pine (*P. resinosa* Ait.) trees within an area of 8,700 ha in Smellie and Wabigoon townships. Approximately 90% of all red pine understory trees in the Blue Water Provincial Park Area suffered 100% defoliation.

Small pockets of moderate-to-severe defoliation were also noted along the Marchington Road in the Sioux Lookout District and in several areas along Highway 17 between Kenora and the Manitoba border. Elsewhere in the Region, numerous colonies were noted but only trace or light damage was observed.

Yellowheaded Spruce Sawfly, *Pikonema alaskensis* (Roh.)

High populations persisted in a number of areas in the Region. In the Sioux Lookout District, ornamental plantings of white spruce in Ojibway Provincial Park and open-grown white and black spruce trees along Highway 72 between Sioux Lookout and Dinorwic suffered nearly complete defoliation. In McAree Township, 86% of open-grown roadside black spruce trees, 1.6 m in height, suffered up to 32% defoliation, while 11% of white spruce trees in a 28-ha plantation near the Vermilion River were 50% defoliated. In the Ignace District, defoliation was as high as 100% on white spruce plantings along pipeline right-of-ways with mortality occurring at several of these sites.

In other districts of the Region, varying degrees of defoliation occurred which were comparable to those of previous years.

White Pine Weevil, *Pissodes strobi* (Peck)

In 1983, leader damage ranged from 0.7% to 11.3% at 11 quantitative sample points in the Region. However, due to other high priority work commitments, only four areas were evaluated in 1984. Leader damage in those areas ranged from .7% to 6.7% (Table 2).

Table 2. Summary of damage by the white pine weevil in the Northwestern Region in 1984 (counts based on examination of 150 randomly selected trees at each location).

Location (Twp)	Host	Estimated area infested (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Leaders attacked (%)
Sioux Lookout District					
McAree	jP	50	3,000	1.9	2.6
Lomond	bS	.85	3,084	1.5	0.7
Ignace District					
Furniss	jP	500	10,000	3.0	6.7
Dryden District					
Aubrey	jP	50	5,000	1.7	3.3

Larch Sawfly, *Pristiphora erichsonii* (Htg.)

No major change in the status of this insect occurred in the Region. Two small pockets of heavy infestation, totalling approximately 2 ha in area, were observed in the Ignace District, along Highway 17 near the English River in Corman Township and near Young Lake on Highway 599. In both areas defoliation was 100%.

Elsewhere in the Region, only trace defoliation was observed during routine survey.

Minor Insects

Introduced Pine Sawfly, *Diprion similis* (Htg.)

This sawfly was first found in 1970, on mature white pine *(Pinus strobus* L.) in the Bear Pass and Rice Bay areas of the Fort Frances District. In 1979 the sawfly was recorded farther north in Caliper Lake Provincial Park and at Kaiarskons Lake. By 1981, the northern boundary was extended by 120 km with larvae collected in the Sioux Narrows area, Kenora District, and in the town of Dryden, Dryden District. Low populations were observed in all the above areas and feeding was observed on white pine, jack pine and red pine. In 1982 and 1983, high populations persisted on islands in the southwestern corner of Lake of the Woods in the Kenora District. Aerial surveys in 1983 revealed that 1,200 ha of

severe defoliation occurred with pockets ranging in size from 1 to 100 ha.

In 1984, high populations continued in the southern portion of the Region, especially on white pine trees growing on islands in Lake of the Woods. Scattered white, jack and red pine trees throughout Godson and Phillips townships, north of Nestor Falls, were also moderately to severely defoliated.

This insect was not observed elsewhere in the Region.

Redhumped Caterpillar, *Schizura concinna* (J.E. Smith)

In 1983, this insect was found in high numbers throughout the entire Region. However, in 1984, populations subsided and only light and moderate infestations were observed at widely scattered areas. Once again damage was most apparent on trembling aspen *(Populus tremuloides* Michx.) and roadside willow *(Salix* spp.).

Light and moderate defoliation were prevalent at numerous points along Highway 72 from Highway 17 north to the town of Sioux Lookout in Dryden and Sioux Lookout districts, and along the Furniss Lake Road in Ignace District.

Elsewhere in the Region low numbers of this insect were occasionally found.

Table 3. Other forest insects.

Insect	Host(s)	Remarks
Acleris variana (Fern.) Eastern blackheaded budworm	wS, bS	commonly found in low numbers across the Region
Archips cerasivorana (Fitch) Uglynest caterpillar	pCh	common on roadside trees at many points in the south western portion of the Fort Frances District
Bucculatrix canadensisella Cham. Birch skeletonizer	wB	declined to trace levels in the Region
Cephalcia sp. Webspinning sawfly	rP	approximately 10% defoliation observed on small roadside trees along Hwy 11, east of Fort Frances

(continued)

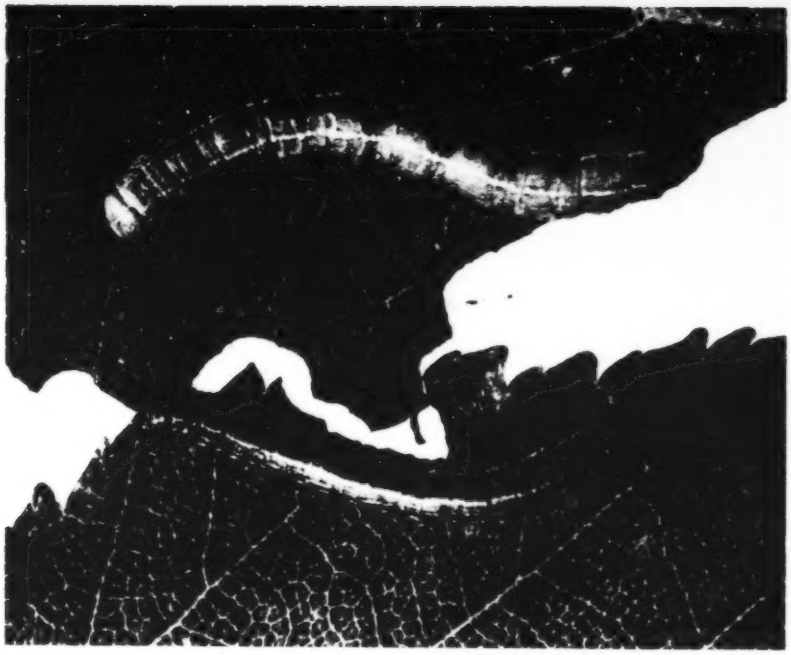
Table 3. Other forest insects.

Insect	Host(s)	Remarks
Chionaspis pinifoliae (Fitch) Pine needle scale	wS, rP	high population levels observed on single trees, Abram Lake, Sioux Lookout District
Corythucha pallipes Parsh. Birch lace bug	wB	caused severe defoliation at Abram Lake, Sioux Lookout District
Dioryctria abietivorella (Grt.) Fir coneworm	bS	caused 5.2% cone damage at a progeny test site, Lomond Twp, Sioux Lookout District
Eucosma gloriola Heinr. Eastern pine shoot borer	jP	less than 3% leader damage across the Region
Fenusa pusilla (Lep.) Birch leafminer	wB	small numbers observed throughout the Region
Halysidota maculata (Harr.) Spotted tussock moth	deciduous species	low numbers observed on a wide variety of hosts in the Nestor Falls and Fort Frances areas
Halysidota tessellaris (J.E. Smith) Pale tussock moth	deciduous species	low numbers found throughout Fort Frances and Kenora districts
Heterocampa manteo (Dbldy.) Variable oakleaf caterpillar	deciduous species	commonly observed in low numbers throughout Fort Frances and Kenora districts
Hyphantria cunea (Dru.) Fall webworm	Al, wB, W	commonly observed in the Fort Frances, Kenora and Dryden districts
Monochamus spp. Sawyer beetles	coniferous species	collapse of population levels throughout the Region
Micrurapteryx salicifoliella Cham. Willow leafminer	W	severe leafmining of roadside trees throughout the Region
Neodiprion pratti banksianae Roh., *N. virginianus* complex Jack pine sawflies	jP, rP	low populations observed throughout the entire Region

(continued)

Table 3. Other forest insects (concluded).

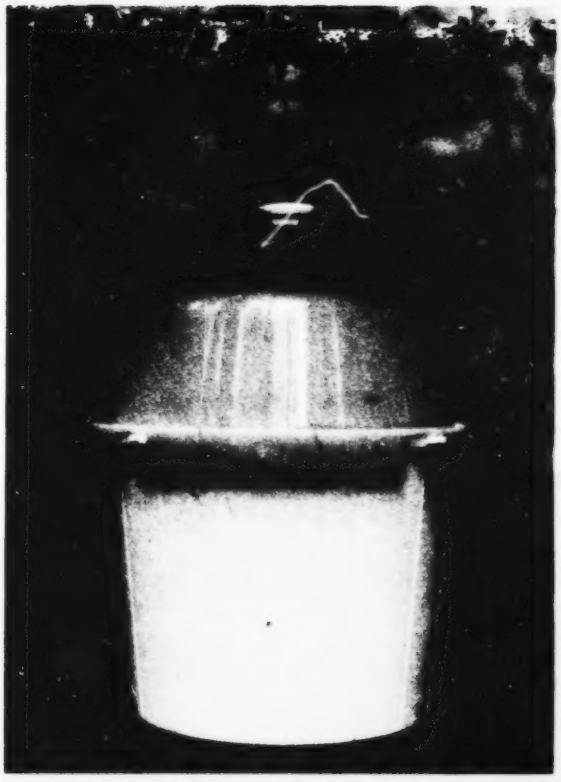
Insect	Host(s)	Remarks
Oligonychus ununguis (Jac.) Spruce spider mite	wS	damaged 11% of the trees in a 28-ha plantation, Vermilion River Rd, Sioux Lookout District
Petrova albicapitana (Busck.) Northern pitch twig moth	jP	trace populations observed in the Region
Phyllonorycter nipigon (Free.) Balsam poplar leafblotch miner	bPo	declined from moderate to trace population levels in the Region
Pineus similis (Gill.) Ragged spruce gall adelgid	wS	2% foliage damage observed in a 1.5-ha plantation, Gull Rock Lake, Red Lake District
Pristiphora geniculata (Htg.) Mountain-ash sawfly	Mo	causing upwards of 100% defoliation to ornamentals in towns of Sioux Lookout, Dryden, Fort Frances and Kenora



Larvae of the fall cankerworm, *Alsophila pometaria* (Harr.)

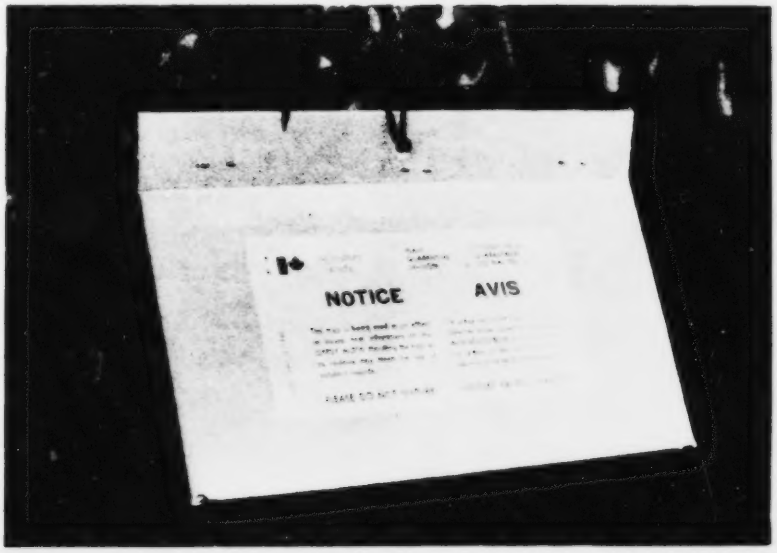
Severe defoliation of Manitoba maple (*Acer negundo* L.)
caused by the fall cankerworm

Insect Pheromone Traps



International Pheromone Trap (IPL) used for spruce budworm, *Choristoneura fumiferana* (Clem.)

Double funnel trap used for spruce budworm



Gypsy moth, *Lymantria dispar* (L.) pheromone trap

TREE DISEASES

Major Diseases

Spruce Needle Rusts, *Chrysomyxa ledi* (Alb. & Schw.) d By. var. *ledi* and *C. ledicola* Lagerh.

General surveys across the Region revealed that these foliar rusts of white and black spruce were present once again at high levels. Scattered white spruce trees along Highway 17 in Corman Township, Ignace District were moderately affected with 100% of the trees affected and foliar damage as high as 50%. In the Sioux Lookout District, damage was very noticeable along the Marchington Road from Sioux Lookout to Savant Lake, with foliar damage ranging from 50 to 75%. Approximately eight seed orchards across the Region were examined, but foliar damage was less than 2%.

Elsewhere in the Region, foliar damage at many locations ranged from moderate to heavy, whereas in 1983 damage ranged from trace to light intensity.

Tar Spot Needle Cast, *Davisomycella ampla* (Davis) Darker

This disease, which can cause severe defoliation of 2-year-old needles of conifers, was widespread this year, although foliar damage was trace to light in most areas.

In 1984, in Lomond Twp, Sioux Lookout District, 8% of trees in a 20-ha jack pine plantation were affected, with foliar damage of 21%. This area was affected to a much higher level in 1983, with 87% of trees affected and 28% foliar damage. In four semipermanent jack pine plantations examined across the Region, this organism was observed at only one location, where 1% foliar damage occurred.

Table 4. Other forest diseases.

Organism	Host(s)	Remarks
Ciborinia whetzelii (Seav.) Seav. Ink spot of aspen	tA	single trees infected at widely scattered points in the Region
Coleosporium asterum (Diet.) Syd. Pine needle rust	jP	66% incidence in a plantation along the Dixie Lake Road, Red Lake District

(continued)

Table 4. Other forest diseases (concluded).

Organism	Host(s)	Remarks
Endocronartium harknessii (J.P. Moore) Y. Hirats. Western gall rust	jP	high amount of infection on root stock present in Dryden Tree Nursery
Isthmiella crepidiformis (Darker) Darker Needle cast	wS	moderate damage observed on fringe trees at a plantation, in Rowe Township, Fort Frances District
Mycosphaerella populicola G.E. Thomps. Leaf spot	bPo	light-to-moderate defoliation at widely scattered locations in the Region
Phellinus tremulae (Bond.) Bond. & Borisov White trunk rot	tA	27% of trees with conks, Moose Lake Road, Sioux Lookout District
Pucciniastrum epilobii Otth Fireweed rust	bF	trace levels of damage observed at numerous points in the Region
Sirococcus strobilinus Preuss Shoot blight	rP	low incidence of infection detected in Jordan and Echo twps, Sioux Lookout District
Venturia macularis (Fr.) MÜller & Arx Shoot blight	tA	50% foliar damage observed on roadsides and fringe trees, along Hwy 105, Red Lake District

ABIOTIC DAMAGE

Frost Damage

During early June, many mature and immature aspen stands across the Region displayed very sparse, dwarfed and tattered-looking foliage, as a result of cold temperatures, 26-29 May. From the air the damage resembled that of insect defoliation. However, careful examination of affected trees showed that it was caused by frost. The outer fringes of the leaf surface were damaged, and as a result the affected areas wilted, turned brown, and eventually broke off from the leaf leaving a tattered effect.

Damage was most noticeable in the Kenora District, especially on islands and numerous areas around Lake of the Woods, and areas west of Kenora to the Manitoba border. Damage was also very conspicuous along Highway 71, from Highway 17 to the town of Minaki, and areas in the vicinity of Cygnet Lake. Upwards of 75% of foliage was affected in the above-mentioned locations. Damage was spotty throughout the Fort Frances District with approximately 50% of the new foliage affected throughout Claxton, Menary and Potts townships along Highway 71. Similar damage was also observed along the south end of Highway 502 in the Big Sawbill Lake area. In the Dryden District, numerous small clumps of trees were affected at widely scattered points. The most noticeable area of defoliation occurred in the Wapagesi and Stormy Lake areas where between 10 and 20 ha of aspen foliage was 75% affected. Throughout the Ignace and Sioux Lookout districts damage was spotty; single trees and small clumps of trees covering areas of up to 5 ha were affected.

In many cases, the trees produced a second crop of leaves with no apparent permanent damage but in some areas this did not happen and the foliage did, in fact, remain dwarfed and very sparse.

Hail and Wind Damage

On the night of 12 July, a storm, accompanied by strong winds and hail, with stones up to approximately 2 cm in diameter, caused severe damage to all species of trees in the Little Turtle Lake area of the Fort Frances District. Ground checks revealed that trembling aspen in this area was so badly damaged that the crowns appeared to have been defoliated by insects. Young fringe trees such as willow and balsam fir displayed scars up to 3 cm in size, especially on the north side.

Of the conifers, spruce (mainly black) sustained little if any damage, but jack pine was almost devastated by the storm. Entire crowns of jack pine were red; however, there is an indication that not all the damage was caused by the storm itself. This storm-damaged area displayed signs of drought in 1983, resulting in further stress to the trees. This stress factor, combined with the severe wind and hail damage, contributed to the demise of trees.

Although some 3,981 ha of forested land were affected by the storm, only 2,350* ha of this total were commercial forest. The total merchantable volume, which include pine, spruce, balsam fir and poplar, was approximately 385,060* cubic metres. Salvage operations were to begin in the fall of 1984.

* Based on figures obtained from OMNR.

SPECIAL SURVEYS

White Spruce Plantation Survey

In 1981 and 1984 special surveys were conducted to determine the incidence and impact of insects and diseases on high volume white spruce plantations. The surveys included six stands stratified on a tree-size basis of <2.0 m, 2.1 to 6.0 m and >6.0 m in height, with two selections from each size class. Due to the lack of high-value white spruce plantations in the Region, only three areas were evaluated. Each stand was evaluated by means of a standard procedure during the period of 19-30 June and again 15-31 July. Insects evaluated were: spruce budworm, yellowheaded spruce sawfly, spruce coneworm, *Dioryctria reniculelloides* Mut. & Mun., white pine weevil and shootworms, *Zeiraphera* sp. Diseases evaluated were: Armillaria root rot, *Armillaria mellea* (Vahl: Fr.) Kummer; needle rust, *Chrysomyza* spp.; spruce cone rust, *C. pirolata* Wint.; spruce broom rust, *C. arctostaphyli* Diet; mistletoe, *Arceuthobium pusillum* Pk.; chlorosis and frost injury. Positive results of the survey are summarized in Tables 5 and 6. Negative results were obtained for both dwarf mistletoe and broom rust on all three plots. Needle rust was the most commonly found disease organism in 1984, affecting an average of 97% of the trees with 27% foliar damage, compared to 72% of trees affected and foliar damage of 1% in 1981. Frost damage affected 36% of trees in 1984, whereas in 1981, 35% of trees examined were affected.

Shootworms and the yellowheaded spruce sawfly were the most common insects observed. The percentage of trees attacked by shootworms in 1984 was 68%, compared to 14% in 1981. In 1984, 13% of the trees were attacked by the yellowheaded spruce sawfly compared to only 1% of trees examined in 1981.

Semipermanent Jack Pine Plots

In 1982, four semipermanent jack pine plots were established across the Region to determine the incidence and impact of specific insects and diseases. To identify the impact of various insects and diseases, the plots were to be visited twice during the regular field season, once during the middle of June and again during August. The following variables were measured: 1) tree height to the base of the growing terminal, 2) terminal growth, 3) pest and disease levels, and 4) mortality. These plots are to be measured and evaluated through 1985. The following insects and diseases were evaluated:

Insects: Jack pine budworm; jack pine sawflies; white pine weevil; eastern pine shoot borer; jack pine tip beetle, *Conopthorus banksianae* McPherson; and northern pitch twig moth.

Table 5. Summary of the results of disease damage in a special survey of planted white spruce in the Northwestern Region (counts based on examination of 150 trees at each location).

Location	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Chlorosis		Frost		Cone rust		Needle rust		*A. mellea*
				Faded green (%)	yellow (%)	Trees affected (%)	Foliar damage (%)	No. examined	% infected	Trees affected (%)	Foliar damage (%)	dead (%)
Red Lake District												
Gullrock Lake	1.5	2,500	4.5	0	0	0	0	100	14	100	5	0
Sioux Lookout District												
Tramp Bay	20	1,200	4.0	11	1	21	1	200	37	100	45	0
Vermilion River Road	28	3,000	1.5	15	2	51	1	nil	0	92	31	1

Table 6. Summary of the results of insect damage in a special survey of planted white spruce in the Northwestern Region (counts based on examination of 150 trees at each location).

Location	Estimated area of stand (ha)	Estimated no. of trees per ha	Avt ht of trees (m)	Spruce budworm	Spruce coneworm	Spruce budworm and spruce coneworm	*Zeiraphera* sp.	Yellowheaded spruce sawfly	
				Trees infested (%)	Trees infested (%)	Defoliation (%)	Trees infested (%)	Trees infected (%)	Foliage affected (%)
Red Lake District									
Gullrock Lake	1.5	2,500	4.5	2	2	1	0	2	2
Sioux Lookout District									
Tramp Bay	20	1,200	4.0	1	0	0	79	29	8
Vermilion River Rd	28	3,000	1.5	5	0	3	56	80	32

Diseases: Needle rusts; Scleroderris canker, *Gremmeniella abietina* (Lagerb.) Morelet; gall rust; stem rusts, *Cronartium* spp.; needle casts; and Armillaria root rot.

In 1983, negative counts were obtained for jack pine budworm, jack pine sawflies, needle rust, Scleroderris canker and stem rusts. However, in 1984, the only negative results obtained were for jack pine budworm; Swaine jack pine sawfly, *Neodiprion swainei* Midd.; and Scleroderris canker. As a result of personnel problems, the earlier visits to the plots in Aubrey Twp, Dryden District and Broderick Twp, Kenora District were not made. Positive results are summarized in Tables 7 and 8.

Hypoxylon Canker, *Hypoxylon mammatum* (Wahl.) J.H. Miller

On the trunks of trees, this organism causes conspicuous cankers, which girdle and weaken the stem making it susceptible to wind snap. Pole-size trees usually succumb in 3 to 7 years, while younger trees may be killed more quickly.

In 1953, in a special survey conducted across the province, it was determined that the disease was province-wide. In 1970, a study plot in Drayton Township, Sioux Lookout District was established and monitored for 5 years. Over this time period, 6% mortality had occurred and an additional 6.5% of trees had stem cankers. In 1977, diseases of aspen were evaluated and a total of 3,200 saplings at 10 sites were examined. At that time no cankers were present in this size class.

In 1984, it was decided to re-evaluate aspen stands throughout the Region. Standard evaluation procedures were conducted at 16 locations (Fig. 2) to estimate the mortality and infection rates. In addition, four areas were selected to establish semipermanent Hypoxylon canker sample plots. Results of the survey are listed in Table 9.

Black Spruce Root Rot Survey

A survey to detect the presence of root rot in black spruce stands across the Region was conducted in both upland and lowland sites (Table 10). The stands selected were more than 25 years old and relatively undisturbed. At each site, 25 trees were examined along a route at 10-m intervals. The sample trees were measured for diameters, height and crown class (dominant or co-dominant). An increment core was taken completely through the sample tree at 15 cm above ground level. Each core was considered to be two radial samples. For each radial sample, the length to the nearest 0.1 cm of sound wood, stained wood and decayed or missing wood was measured. For each stand a disc or a 50- to 100-cm^3 portion of defective wood from two live trees was obtained. The choice of sample trees was based on crown appearance (sparse foliage or dead

Table 7. Summary of insects found in the semipermanent jack pine plots in the Northwestern Region in 1983 and 1984.

Location	No. of trees examined	Estimated area of stand (Z)	Estimated no. of trees per ha	Avg ht of trees (m)		White pine weevil: Trees weeviled (Z)		Eastern pine shoot borer: leader damage (Z)		Jack pine tip beetle: Trees damaged (Z)		Northern pitch twig moth: Trees damaged (Z)		Jack pine sawfly: Trees affected (Z)	
				1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984
Sioux Lookout District															
Vermilion River	250	100	3,000	1.4	2.4	1.3	0.8	5.6	2.0	1.2	3.2	0.4	0.8	0.0	0.0
Kenora District															
Broderick Twp	25	3,600	8,000	1.7	2.2	0.0	4.8	4.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0
Ignace District															
Furnise Twp	250	876	7,500	1.7	2.1	0.8	6.8	2.8	1.2	0.8	2.8	0.4	0.0	0.0	0.0
Dryden District															
Aubrey Twp	250	150	7,000	1.8	2.2	0.0	0.4	1.2	2.4	0.0	0.0	2.4	0.0	0.0	0.8

Table 8. Summary of diseases found in the semipermanent jack pine plots in the Northwestern Region in 1983 and 1984.

Location	No. of trees examined	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)		Needle rust				Stem rusts		Western gall rust		Needle cast		Armillaria root rot	
						Trees affected (%)		Foliar damage (%)		Trees affected (%)		Trees affected (%)		Foliar damage (%)		Mortality (%)	
				1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984
Sioux Lookout District																	
Vermilion River	250	100	3,000	1.4	2.4	0.0	0.0	0.0	0.0	0.0	0.4	12.0	11.2	0.0	0.0	0.4	0.0
Kenora District																	
Broderick Twp	225	3,600	8,000	1.7	2.2	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.4
Ignace District																	
Furnies Twp	250	876	7,500	1.7	2.1	0.0	3.6	0.0	0.4	0.0	0.0	9.6	0.0	4.0	1.0	0.0	0.0
Dryden District																	
Aubrey Twp	250	150	7,000	1.8	2.2	0.0	0.0	0.0	0.0	0.0	0.0	14.8	0.0	0.0	0.0	0.0	0.0

NORTHWESTERN REGION

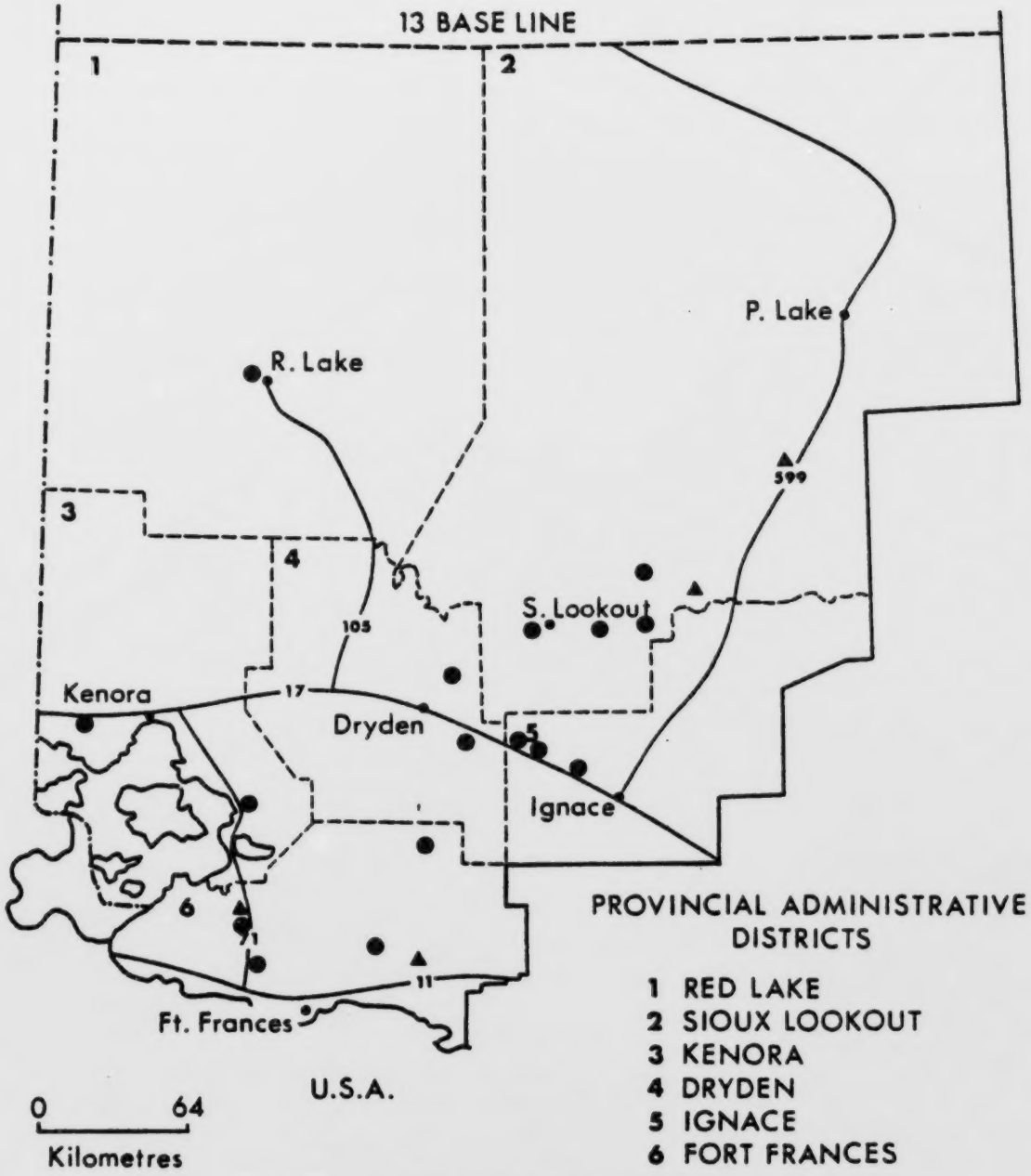


Figure 2. Hypoxylon Canker, *Hypoxylon mammatum* (Wahl.) J.H. Miller

Evaluations . . . . . ●
Permanent sample plots . . . ▲

Table 9. Summary of damage caused by Hypoxylon canker of aspen in six districts in the Northwestern Region in 1984 (counts based on 150 randomly selected trees at each location).

Location	Avg DBH of trees (cm)	Basal area of host species (m^2/ha)	Estimated area (ha)	Trees diseased		Current mortality (%)
				Branch (%)	Stem (%)	
Sioux Lookout District						
Lewis Lake[a]	24	28	50	0.0	0.7	0.7
Hamilton Lake[a]	26	32	150	0.0	0.7	0.0
Superior Jct	22	12	100	0.0	2.0	0.0
Moose Lake Road	23	20	100	0.7	0.7	0.0
Stanzhikimi Lake Road	18	15	50	0.0	0.7	0.0
Drayton Twp	9	30	50	0.0	4.0	1.3
Ignace District						
Revell Twp	22	16	200	0.0	0.0	3.3
Bradshaw Twp	17	27	100	0.0	0.7	0.7
Hodgson Twp	17	12	200	0.0	3.3	2.0
Kenora District						
Ewart Twp	22	18	10	0.0	2.0	1.0
Devonshire Twp	21	19	20	1.0	2.0	0.0
Fort Frances District						
Mather Twp	9	25	20	0.0	2.7	1.3
Scattergood Lake	23	14	10			
Big Sawbill Lake	22	25	40			
Richardson Twp	15	20	20			
Otter Falls[a]	21	24	20	0.0	2.7	0.0
Menary Twp[a]	22	21	40	0.7	4.6	0.0
Dryden District						
Stokes Twp	16	18	20	2.0	3.3	2.7
Satterly Twp	18	13	40	0.0	1.3	0.7
Red Lake District						
Heyson Twp	16	16	20	0.0	0.7	0.0
Average for Region	18.4	20.5	63	0.2	1.6	0.68

[a] Study plots to be re-examined in 1986.

Table 10. Summary of the black spruce root rot survey in four districts in the Northwestern Region (data based on the examination of 25 trees at each location).

Location	Avg DBH of trees (cm)	Avg tree age	Basal area of host species (m^2/ha)	Site	Avg no. of trees affected (rot and stain) (%)	Avg amt of rot at 15 cm[a] (%)
Dryden District						
Hwy 502, 17 km N of Rattlesnake Creek	21.7	56	18.5	Upland	28.0	11.5
Ignace District						
Revell Twp	13.5	59	15.8	Upland	0.0	0.0
Sioux Lookout District						
Sleen Lake area	15.9	80	12.5	Lowland	16.0	3.8
Lomand Twp	16.4	59	19.0	Upland	0.0	0.0
McAree Twp	10.4	25	18.3	Upland	0.0	0.0
Red Lake District						
Hwy 105, 8 km N of Ear Falls	14.3	150	15.3	Lowland	48.0	16.8

[a] Height at which core was extracted.

tops), wounds, old fruiting of the causal fungus or the presence of mycelial fans. The samples were submitted to the Great Lakes Forest Research Centre (GLFRC), Sault Ste. Marie, for culturing and identification of the disease organisms involved.

Internal rot was found in three of six stands examined, and affected between 3.8 and 16.8% of trees sampled.

Samples submitted for culturing revealed that most of the fungi were secondary, and are normally present in stands to some degree. One of the most widespread root-rotting fungus in Ontario, *Polyporus tomentosus* Fr., which has accounted for losses as high as 38%, was not detected in any stands examined.

Seed Orchards

In 1984, at the request of OMNR, at least one visit was made to several (12) of the Tree Improvement Site areas. During the period from 12 June to 17 July, eight black spruce seedling orchards, two black spruce family test areas and two white spruce clonal orchards were examined for the presence of insect and disease pests. The number of trees sampled ranged from 150 to 200 at each site. From 3 to 93% of the trees were infested with budworm; however, usually no more than two feeding sites per infested tree were observed. As a result, damage was minimal. Defoliation by the yellowheaded spruce sawfly ranged from 1 to 10%. The spruce needle rust was detected at all areas examined; however, in all cases foliar damage was less than 2%.

Egg mass samples taken at nine sites during late August were negative. However, since many of these locations are in the budworm infested area, it can be expected that larvae will be present at many of them in 1985.

White Spruce Flower, Cone and Seed Survey

Because of increasing emphasis on forest regeneration, forest managers are concerned about problems related to seed production. Accordingly, a white spruce flower and cone survey was conducted in the Region in 1984. Between mid-May and the first week of June, two collections of female flowers were obtained to determine what insects were damaging the flowers. During the period from mid-July to approximately 10 August, four samples, each consisting of 100 fully mature but unopened cones, were collected at widely scattered locations in the Region.

All samples were submitted to the GLFRC, Sault Ste. Marie, for dissection and analysis. Results of the survey are summarized in

Tables 11 and 12. The most commonly found insects in order of importance were: Lepidoptera larvae, which include the spruce budworm; the spruce coneworm; and the spruce cone maggot, *Hylemya anthracina* (Czerny).

Table 11. Summary of damage to white spruce female flowers at two locations in the Northwestern Region in 1984.

Location	No. of flowers examined	Damaged flowers (%)	Principal damaging agents		
			Spruce budworm (%)	Spruce coneworm (%)	Miscellaneous insects (%)
Sioux Lookout District					
McAree Twp	251	43.1	29.9	1.6	11.6
Fort Frances District					
Big Sawbill Lake	100	51.0	12.0	37.0	2.0

Table 12. Summary of white spruce seed and cone damage at four locations in the Northwestern Region in 1984.

Location	No. of cones examined	Damaged cones %	Seed loss within damaged cones %	Principal causes of seed loss and percent of loss caused by each organism
Sioux Lookout District				
McAree Twp	100	66	64	Lepidoptera larvae - 48% *Hylemya anthracina* - 18%
Superior Junction	100	70	49	Lepidoptera larvae - 54% *Hylemya anthracina* - 16%
Kenora District				
Highway 596	100	46	51	Lepidoptera larvae - 30% *Hylemya anthracina* - 16%
Fort Frances District				
Big Sawbill Lake	100	98	61	Lepidoptera larvae - 84% *Hylemya anthracina* - 14%

Pinewood Nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer.) Nickle

In 1983 and again in 1984, as part of general surveys, attention was directed towards this pest. Efforts were made to sample any recently wilting or dying pine trees for the presence of this nematode, which multiplies in the wood and interferes with the water transportation system of the tree. Samples were submitted from areas where sawyer beetles, *Monochamus* spp., were present, as the nematodes are spread by this insect. However, all samples submitted in 1984 were negative, as they had been in 1983.

In 1982, the Manitoba Department of Natural Resources and the Department of Plant Pathology, University of Minnesota, reported the first occurrence of the nematode in Canada. Two recently dead jack pine trees in Belair Provincial Forest, approximately 75 km north of Winnipeg, infected with dwarf mistletoe, *Arceuthobium americanum* (Nutt. ex Engel.) were infested with bark beetles, wood borers and nematodes morphologically indistinguishable from *B. xylophilus* collected from pines in the United States. It is believed that dwarf mistletoe was the primary cause of mortality and that the nematodes were transmitted to the stressed trees during oviposition of bark beetles and wood borers. Surveys will continue in 1985.

Acid Rain National Early Warning System

As part of a national early warning system for acid rain, the Forest Insect and Survey Unit (FIDS) of the GLFRC has established study plots at various locations across the province. Two areas were selected in the Northwestern Region after consultation with the OMNR. In the Sioux Lookout District, a study plot was established in a black spruce stand near Sandle Lake, off Highway 642 north of Sioux Lookout, and in a jack pine stand in Dance Twp in the Fort Frances District. The plots are designed so that FIDS staff can detect as early as possible any damage that may occur to the forest because of acid precipitation. At each location, various parameters were measured, such as vertical and radial growth, crown class and density, mortality and incidence of insect and disease attack. Later studies will include foliage and soil analysis. The plots are located on land which will have few if any disturbances within the next few years. The plots will be monitored on a yearly basis and plans are under way to establish further study areas throughout the province.

Insect Pheromone Traps

In 1984 the FIDS Unit participated in a study to determine the usefulness of various pheromone traps as a survey tool. Adults are attracted to these traps by a synthetic sex attractant placed inside these traps. Several types of traps are employed depending upon the insect that is being monitored.

Spruce Budworm Pheromone Traps. In 1984, two types of spruce budworm traps were tested (see photo page): the double-funnel trap (DFT) and the International Pheromone Limited (IPL) trap. These traps were placed at nine locations in the Region and in series with each other. Since this type of trapping is still in the experimental stage, further studies will continue on its effectiveness as a survey tool.

Gypsy Moth, *Lymantria dispar* (L.), Pheromone Traps. As part of a province-wide survey in cooperation with Agriculture Canada, six traps were placed in three provincial parks in the Region (see photo page). Camping sites were selected because the eggs of this insect can be carried on all types of vehicles travelling from infested areas elsewhere. Traps checked contained no adult gypsy moths. The trapping program will be repeated in 1985.

Climatic Data

Environmental conditions such as temperature, wind and precipitation play an important role in the development of insects and diseases as they occur in the forests. Therefore the FIDS Unit will now present temperature and precipitation data in our annual reports for two areas of the Northwestern Region (Table 13). Also included in Table 13 are the normals for Sioux Lookout and Fort Frances districts from 1930 to 1980. Data were obtained from Environment Canada Atmospheric Weather Stations.

Table 13. Summary of the mean temperature and total precipitation from two locations in the Northwestern Region in 1984.

Location	Month	Mean temperature (°C)		Deviation from normal (°C)	Total precipitation (mm)		Deviation from normal (mm)
		Normal[a]	Actual		Normal[a]	Actual	
Fort Frances Airport	January	-16.9	-17.3	-0.4	30.6	14.0	-16.6
	February	-13.1	-10.3	+2.8	22.7	16.3	-6.4
	March	5.7	-9.5	-3.8	31.6	4.0	-27.6
	April	3.8	7.7	+3.9	48.5	27.1	-21.4
	May	11.0	8.9	-2.1	71.2	49.9	-28.7
	June	16.4	16.1	-0.3	101.7	202.7	+101.0
	July	19.2	18.0	-1.2	103.6	72.1	-31.5
	August	17.7	19.8	+2.1	82.6	50.1	-32.5
	September	12.2	10.6	-1.6	83.8	39.7	-44.1
	October	6.6	5.6	-1.0	50.9	126.7	+75.8
	November	-3.2	-6.9	-3.7	36.8	33.6	-3.2
	December	-12.4	-10.8	+1.6	31.8	44.4	+12.6
Sioux Lookout Airport	January	-19.4	-20.9	-1.5	36.0	28.2	-7.8
	February	-15.7	-7.3	+8.4	27.6	19.3	-8.3
	March	-8.3	-9.7	-1.4	35.0	19.2	-15.8
	April	1.4	6.4	+5.0	45.2	26.7	-18.5
	May	9.2	8.0	-1.2	65.8	87.5	+27.7
	June	15.2	15.7	+0.5	91.7	120.6	+28.9
	July	18.3	18.5	+0.2	93.7	78.0	-15.7
	August	16.6	19.9	+3.3	88.3	60.2	-28.1
	September	10.7	9.5	-1.2	81.6	48.7	-32.9
	October	4.7	6.7	+2.0	64.9	80.2	+15.3
	November	-5.3	-4.4	-0.9	49.9	51.1	+1.2
	December	-15.1	-16.7	-1.6	33.7	51.9	+18.2

[a] Normal temperature and precipitation are based on the period 1930-1980